

January 23, 2002

TESTING ARRANGEMENT FOR OPTICAL DEVICES

BACKGROUND OF THE INVENTION

The present invention relates to the testing of optical devices.

Optical devices under test (DUT) are generally tested or measured by applying
5 an optical signal and measuring a response on the applied signal. Such
measurements, however, are normally subject to noise caused by optical,
electrical, and mechanical sources.

In particular, interferometric measurements employing interferometers (such
as e.g. Michelson or other interferometers) have been found to be highly
10 susceptible for mechanical disturbances such as vibration or shock even
caused by sound.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved measurement of
optical component. The object is solved by the independent claims. Preferred
15 embodiments are shown by the dependent claims.

According to the present invention, a measurement setup for measuring an
optical device under test (DUT) is provided comprising a measurement unit with
reduced susceptibility to mechanical noise such as e.g. sound or vibration. The
measurement unit comprises an optical circuit with such optical components
20 showing high susceptibility to mechanical noise. Such components might in
particular comprise interferometers. The optical circuit is provided in a casing
providing a shielding against mechanical noise. Preferably the casing is
provided with relatively high weight, thus rendering the casing less susceptible
to be excited by mechanical vibrations. The casing might therefore comprise
25 mass plates or be entirely of a material massive relative to the optical circuit or
its components.

While the optical circuit might be attached directly to at least one part of the casing, a vibration damping or shielding might be provided therebetween. This can be done by providing e.g. a rubber sheet between the optical circuit and the casing.

- 5 In a preferred embodiment, the measurement unit is further adapted to bear the DUT, so that the DUT will also benefit from damping of or shielding against mechanical noise as provided by the measurement unit. While the DUT can be placed directly onto the optical circuit housed within the casing, it is preferably provided outside the casing such as e.g. on top of the casing. This has the
- 10 advantage that the casing need not be opened for inserting the DUT, which again can also be cause for measurement faults. A provision of the DUT outside the casing also leads to a higher reproducibility of measurements, since the measurement environment can be regarded as being substantially maintained. Preferably, a DUT holding unit is situated on top of the casing
- 15 which might provide facilities for locating, arranging or coupling one or more DUTs. The DUT holding unit is optically coupled with the optical circuit e.g. by using fiber connections.

In another preferred embodiment, the measurement unit further comprises at least one vibration absorption device for absorbing vibrations of the casing.

- 20 One or more of the vibration absorption devices might be arranged underneath the casing. Each vibration absorption device preferably comprises an arrangement of resilient members and plastic members, thus damping and absorbing mechanical vibrations.

- 25 In a further preferred embodiment, the optical circuit comprises only such (optical, electrical or mechanical) components substantially providing no own vibration at least during defined measuring times.

The measurement unit preferably comprises one or more optical inputs for receiving an optical signal for measuring the DUT, one or more optical contacts for coupling the DUT, and one or more optical outputs for providing optical

signals in response to the applied optical input signals.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and many of the attendant advantages of the present invention will be readily appreciated and become better understood by reference to the following detailed description when considering in connection with the accompanied drawings. Features that are substantially or functionally equal or similar will be referred to with the same reference sign(s).

Fig. 1 shows in explosion view a preferred embodiment according to the present invention.

- 10 Figure 2 shows an example of an optical measurement arrangement according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

- 15 In Figure 1, a measurement unit 10 comprises an optical circuit 20 being arranged between a lower casing part 30 and an upper casing part 40. The optical circuit 20 carries one or more optical devices and/or circuits and in particular such optical circuits or devices being susceptible to mechanical noise such as vibration.

- 20 The measurement unit 10 further comprises a DUT holding unit 50 adapted for receiving an optical DUT (not shown in the figures). An adapter 60 might be provided for coupling an optical connection from the circuit board 20 to the DUT holding unit 50.

- 25 The lower casing part 30 is situated on four vibration absorption devices 70A – 70D, one on each side. From the perspective of Figure 1, only three of the four vibration absorption devices can be seen. The upper and lower casing parts 30 and 40 are provided as mass parts with substantially higher weight relative to the circuit board 20. In a preferred embodiment, the upper and lower

casing part 30 and 40 weigh approximately 20kg, while the optical circuit board 20 roughly weighs less than 1kg.

When assembled together, the optical circuit board 20 is mounted to the lower casing part 30, whereby preferably a rubber sheet 80 is inserted in-between.

- 5 The adapter 60 is coupled to the optical circuit board 20 and the upper casing part 40 will be attached (e.g. using screws or similar attaching devices) to the lower casing part 30, so that the circuit board 20 is housed within a casing comprised of the upper and lower casing part 30 and 40.

- 10 The DUT holding unit 50 is attached on top of the upper casing part 40 adapted to couple one or more optical devices thereto and providing an optical connection to one or more optical circuits situated on the optical circuit board 20. The DUT holding unit 50 is preferably provided with adequate facilities allowing to easily arranging one or more DUTs as well known in the art.

- 15 The entire assembly comprised of upper and lower casing parts 30 and 40 including the circuit board 20 and the DUT holding unit 50 is placed onto the vibration absorption devices 70A – 70D in order to absorb vibrations of the assembly.

- 20 In Figure 2 an optical source 100, such as a wavelength tunable laser source, couples an optical signal to an input 110 of the measurement unit 10. A DUT 120 is coupled into one part of an interferometer 130. Both paths of the interferometer 130 receive the optical input signal from the source 100. An optical detector 140 is coupled to the output of the interferometer 130 and detects the interference signal in response to the applied input signal.

- 25 While the measurement unit 10 comprises the optical circuit provided by the interferometer 130 and also bears the DUT 120 (as shown in Figure 1), the optical source 100 as well as the optical receiving device 140 represent external devices with respect to the measurement unit 10. The measurement unit 10 is adapted to be coupled to such external devices by providing the input

110 and the output 150. As apparent from Figure 1, the casing provided by the upper and lower casing parts 30 and 40 might provide throughputs 200 to couple such external devices of the optical circuit board 20.